

THE GENUS CORIARIA (CORIARIACEAE) IN THE WESTERN HEMISPHERE¹

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With the recent awakening of research in hallucinogenic plants, some attention has been given to the genus *Coriaria*. Plants of this genus are known to be toxic to animals when taken internally, as well as being hallucinatory in small quantities. Studies of its toxicity and the application of the toxic elements in treatments of barbiturate poisoning have made necessary a basic taxonomic study of *Coriaria*.

This paper deals with taxonomic studies of the plants which occur in the Western Hemisphere. *Coriaria* inhabits warm temperate regions of southern South America, and, in the tropical areas, high elevations of the northern Andes, ranging north through Central America to the Sierra Madre Occidental in Mexico. *Coriaria* is known also from southern Europe, North Africa, the Himalayas, islands of the Pacific coast of Asia and the western Pacific Ocean, including New Zealand. The genus makes an interesting study of geographical distribution and dispersal which has resulted in highly disjunct populations. The plants of the Western Hemisphere have close relatives on the other side of the Pacific Ocean, but these are excluded from consideration here.

PHYLOGENY OF THE GENUS

As the only genus in the family Coriariaceae, *Coriaria* has no close relatives and no close morphologic affiliation with any other family. In 1816 De Candolle placed *Coriaria* in the Rhamnaceae. Since that time the position of *Coriaria* in a phylogenetic system has changed often with various authors, ranging from alliances with the Urticaceae (Maximowicz, 1881) to a much more advanced position near the Araliaceae (Russow, 1884). Most often the genus has been

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placed near the Anacardiaceae as was done by Bentham and Hooker in 1862. Hutchinson in 1964 placed *Coriaria* in its own order, Coriariales, between the Dilleniales and the Rosales, and derived from the former. Cronquist (1968), with a note of doubt, has placed the Coriariaceae in the Ranunculales.

The phylogenetic relationships of the Coriariaceae cannot be determined accurately without, perhaps, the discovery of some "pre-*Coriaria*" which would link the family to another group. It is apparently not closely related to any single other family; it has long been distinguished and kept separate from other families and probably should not be closely associated with others in the same order. There is, however, no single character of the family that sets it apart, but a combination of traits. If the dicots are viewed as polyphyletic, *Coriaria* could be one of the distinct lines which branched from the main line of evolution sometime in the Cretaceous, retaining many primitive characters while evolving other more advanced or specialized traits.

If one lists the characteristics of dicotyledonous families and then attempts to place a family among them, correlations become evident which can sometimes be interpreted as showing evolutionary relationships; with *Coriaria* this has not been successful. Various characters of dicots are considered as being either primitive or advanced. These often determine the position of the family in a phylogenetic order. Maximowicz (1881) attempted to draw conclusions about relationships by using morphological characters of various families, then weighting them as to their importance in *Coriaria*. After totaling the values, Maximowicz concluded the genus was most closely allied to the Simaroubaceae, and also had affinities with the Phytolaccaceae. If one had to select another family in which *Coriaria* could be placed, one might choose the Rosaceae. The characters of *Coriaria* fall within the broad limits of this family, as defined or delimited by Lawrence (1951) and Hutchinson (1964). Within the Rosaceae, though, there is no single genus to which *Coriaria* is closely related. The genus fits

less well in the Simaroubaceae or Erythroxylaceae, and only superficially in the Brunelliaceae. Paralleling this viewpoint, Hutchinson has placed *Coriaria* in a distinct order between the Brunelliaceae and Rosaceae, and Hallier (1905) placed the Coriariaceae in the Rosales, but allied to the Simaroubaceae.

TAXONOMY

Coriaria L., Genera Plantarum, ed. 5. 459. 1754. Type: *Coriaria myrtifolia* L.

Heterocladus Turcz., Bull. Soc. Imp. Naturalistes Moscou 20: 152. 1847. Type: *H. caracasanus* Turcz. Non *Heterocladia* Dnd. as *Hererocladia* Dnd. ex Turcz., sphalm. ex Jacks.

Heterophyllea Turcz., Bull. Soc. Imp. Naturalistes Moscou 21: 591. 1848. Type: *H. caracasana* (Turcz.) Turcz.

Subshrubs to small trees. Roots fibrous, with prominent nitrogen-fixing nodules. Stems rhizomatous, the branches sharply quadrangular, becoming terete, eventually arching to pendulous, the lenticels corky. Clusters of axillary buds produced in the axils of the leaves of the main axes. Leaves simple, whorled to opposite, appearing distichous through alternate twisting of the branches, often approximate above, short-petiolate to subsessile, the minute stipules withering and persistent or caducous, the blades palmately veined, lanceolate to ovate, entire, cordate, truncate to rounded at the base, the apex rostrate to mucronate. Racemes erect to pendent, terminating main or lateral axes. Flowers small, basically pentamerous, actinomorphic, or the calyx slightly zygomorphic, perfect, polygamomonoecious, andromonoecious or appearing so through marked proterogyny, hypogynous, green, red or dark purple, the pedicels ebracteolate to several-bracteolate, the sepals at fertilization, but accrescent and prominently fleshy subulate, persistent, the petals distinct, shorter than the sepals at fertilization, but accrescent and prominently fleshy in fruit, ultimately black, red or yellow, stamens 10 in two

whorls, with filiform filaments 2 mm. long, each anther sagittate, smooth to verruculose, 4-celled, dehiscing by longitudinal slits, the pollen spheric, 3-colporate, pistils 5 to 10 (-12), distinct, simple, the styles fasciculate and strict or divergent, papillose and stigmatic over their entire surfaces. Ovule solitary, pendant. Fruits dorsally keeled achenes, each bilaterally compressed, all enclosed by the fleshy accrescent petals. Seeds with a single membranous testa and scanty endosperm.

Key to the species and subspecies of *Coriaria*. (All known species included here for completeness.)

- a. Bases of lateral branches nearly always without bud scales; inflorescences produced terminally, either on the main stem or on branches, but on the current flush of growth; racemes sparsely to very densely pubescent; bracts subtending the flowers lanceolate to elliptic, entire; flowers strictly perfect; inner whorl of stamens free; achenes 1 to 2 mm. long. (b)
 - b. Stems herbaceous, dying to the ground following maturation of fruits; leaves of the flowering axes ovate to suborbiculate, with 7 to 9 main basal veins; fruit pedicels more than 1.5 cm. long. Himalayas of Tibet to China. *Coriaria terminalis*
 - b. Stems woody, perennial; leaves of the flowering axes lanceolate to elliptic, with 3 to 5 main basal veins; fruit pedicels less than 1 cm. long.
 - Coriaria ruscifolia*
- c. Suffruticose herbs to large shrubs; main axes bearing numerous short branches bearing inflorescences terminally; leaves 0.5 to 3.1 cm. long. Western slopes of the Andes from Mexico to Peru, and cool mountains of New Guinea and New Zealand.
 - Coriaria ruscifolia* subsp. *microphylla*
- c. Large shrubs to small trees; main axes bearing inflorescences in the axils of the leaves or rarely on short branches; leaves 1.0 to 7.5 cm. long. Temperate coasts of Chile, New Zealand and

- other Pacific islands.
..... *Coriaria ruscifolia* subsp. *ruscifolia*
a. Bases of lateral branches surrounded by persistent bud scales; inflorescences produced from the axils of the leaves of the previous flush of growth; bracts subtending the flowers ovate to orbiculate; flowers usually andromonoecious; inner whorl of stamens epipetalous. Shrubs of the Northern Hemisphere. (d)
d. Racemes finely puberulent to densely pubescent; achenes 1.5 to 2.5 mm. long; bracts subtending the flowers subentire to erose. Northern India, Nepal and Western China. *Coriaria nepalensis*
d. Racemes glabrous; achenes more than 3 mm. long; bracts subtending the flowers entire. (e)
e. Accrescent petals far exceeding the mature achenes and enclosing them; leaves ovate-lanceolate; styles linear to fusiform. Japan, Formosa and the Philippines. *Coriaria japonica*
e. Accrescent petals not exceeding the exposed mature achenes; leaves subelliptic; styles filiform. West-Mediterranean region.
..... *Coriaria myrtifolia*

Coriaria ruscifolia L., Species Plantarum, ed. 1. 1037.
1753.

Plants fruticose; new branches sprouting and developing rapidly, fleshy, at first terete, green to purple to gray, secondary growth producing a quadrangular stem which is brown or gray at maturity, cork developing early, lenticels present only on the previous flush of growth, scaly terminal buds not formed.

Leaves subsessile, glabrous and dark green above, puberulent on the emersed veins and paler beneath; leaves of the main stem orbiculate, with 5 to 9 main basal veins, those of the lateral branches elliptic to lanceolate, with 3 to 5 main basal veins, acute to cordate at the base, the apex acute to mucronate.

Racemes few to numerous, pendent, finely to densely pubescent, the pedicels ebracteolate, 3 to 6 mm. long, at

maturity less than 1 cm. long, with entire, lanceolate to subulate bracts. Flowers 2 to 3 mm. in diameter, usually pentamerous, regular, perfect, proterogynous, sepals ovate, green to red, 1.5 to 2 mm. long, 1 to 1.5 mm. wide, petals smaller, ovate, anthers yellow to reddish, styles linear, fasciculate, green to purple, matured achenes enclosed by the accrescent fleshy, black petals, 1 to 2.5 mm. long.

The numerous populations of *Coriaria* found in the Western Hemisphere are here regarded as two subspecies of a single species, polymorphic in leaf size and shape and habit in response to geographic location and altitude. The characters which unite all these plants into one species are listed below:

1. The inflorescences are produced on wood of the current growing season. These racemes are either borne terminally on the lateral leafy branches or from the axes of the large orbiculate leaves on the main axes.
2. The leaves on the lateral branches have 3 to 5 veins.
3. The flowers have the same morphology throughout the distributional range and are always perfect, a trait shared only with *Coriaria terminalis* of the Himalayas.

The two subspecies have heretofore been maintained as separate species since they were first described. Reducing these taxa from species to subspecies reflects their similarity and at the same time illustrates the differences in morphology which are ecological adaptations to altitudinal changes. At higher elevations, 600 m. to 4000 m. in the Andes, small-leaved forms occur while larger-leaved forms grow at elevations from sea level to 300 m. in southern South America. Another character which varies with altitude and which is noticeable in dried specimens as well as in the living plants is the increased numbers of lateral branches occurring with increased elevation. The correlation with altitude of these variations, independent of genetic constitution, has been demonstrated by comparisons of seedlings of South American forms grown under identical greenhouse conditions at the University of Connecticut. Seeds were collected in Colombia at 3200 m. (Skog 1000)

and Chile at 5 m. (*Skog* 1075), germinated and grown together in the greenhouse. The resulting plants were similar in leaf size and shape, and bore few lateral branches. (Herbarium vouchers are on file at CONN of the representative plants, *Skog* 1375, 1376.) Studies of herbarium specimens and field observations indicate that when plants otherwise assignable to the small-leaved subspecies, *C. ruscifolia* subsp. *microphylla*, are found at lower elevation (less than 1000 m.) the leaves are larger and the individuals have fewer lateral brances.

Coriaria ruscifolia L. subsp. *ruscifolia*

Coriaria ruscifolia L., Species Plantarum, ed. 1. 1037. 1753. Type: Feuillée, Journal des observations physiques, mathématiques et botaniques 3 [Histoire des plantes médicinales . . . du Perou & du Chily]: 17, t. 12. 1725?

Large shrubs to small trees. Main axes to 7 m. long, bearing whorled or opposite leaves 1.0 to 7.5 cm. long, 0.8 to 3.2 cm. wide. Racemes arising from the axils of the leaves of the main axes, or at the apices of the few lateral branches, to 25 cm. long.

Vernacular names: CHILE: deu, dehue-lahuen, deó, hiuque, mataratones, veu.

Distribution and habitat in the Western Hemisphere: River banks or lake shores in western Argentina in the province of Neuquén, and in central and southern Chile in the provinces of Arauco, Biobio, Cautin, Chiloé, Concepción, Llanquihue, Malleco, Maule, Ñuble, Osorno, Santiago and Valdivia.

Representative specimens examined: ARGENTINA. PROVINCE OF NEUQUÉN: Lago Nahuel Huapi, Isla Victoria, *Cordini* 8 (F, US). CHILE. PROVINCE OF ARAUCO: Contulmo, *Gunckel* 21784 (CSG); *Santa Cruz* s. n., I.835 (BH). PROVINCE OF BIOBIO: Fundo 'Los Prados,' *Riegel* s. n., Jan. 1, 1955 (CSG). PROVINCE OF CAUTIN: Rio Quepa, Temuco, *D. Bullock* s. n., 31 Jan. 1906 (BM); Quebrada del Río Palquin, *Gunckel* 15413 (CSG); Puerto Saavedra, *Hollenmayer* 8 (CSG, M). PROVINCE OF CHILOÉ: Chiloé, *J. Anderson* 61 (BM); Piruquina, *Junge* s. n., Mar. 25, 1932 (CSG); *Junge* 386 (M, MO); near Puerto Varas, 50 m., *Morrison* 17537 (BH, GH, MO); Castro, 1-10 m., *Pennell*

12600 (F, GH, SGO, US); cerros cerca de Chonchi, *Ricardi* 5308 (CONC, CONN). PROVINCE OF CONCEPCION: Laraquete, *Castillo* s. n., Feb. 1946 (CSG); Conception, *Cuming* 1461 (BM); Tomé, *Germain* s. n., Nov. 1855 (GH, SGO); Talcahuano, *Pöppig* 131 (BM, MO); near Tumbes, 5 m., *Skog* 1040 (CONN). PROVINCE OF LLANQUIHUE: Lago Llanquihue, *Calvert* s. n. in 1912 (BM); Petrohue, *Gunckel* 9227 (CSG); Piedra Azul, *Ricardi* 5286 (CONC, CONN); Casa Panque, *Shannon & Shannon* 24 (US); near Los Riscos, 200 m., *Skog* 1073, 1074, 1075 (CONN); near Ensenada, 100 m., West 4678 (GH, MO). PROVINCE OF MALLECO: Puren, *Claude-Joseph* 3029 (US). PROVINCE OF MAULE: Constitución: *Burnier* s. n., Sept. 1958 (CSG), *Gunckel* 21785 (CSG), *Volckmann* s. n. (SGO). PROVINCE OF ÑUBLE: Valle Rio Renegado: *Alvares Ramirez* s. n., Mar. 1954 (CSG), *Cuming* 146 (E, GH); Valle de Alico, *Jarpa* s. n., Feb. 10, 1935 (CSG); *Reed* s. n., 1871 (BM, GH); *Sargent* s. n., Jun. 29, 1906 (A). PROVINCE OF OSORNO: Fundo Río Blanco, southwest of Purranque, *Eyerdam* 10758 (F, US); Lago Llanquihue, *F. Phillipi & Barchers* s. n., 15/1/85 (BM); north shore of Lago Llanquihue, *Senn* 4635 (MO, US); southwest of Puerto Klocker, near Lago Llanquihue at base of Volcán Osorno, *Skog* 1062, 1064 (CONN). PROVINCE OF SANTIAGO: *Claude-Joseph* 957 (GH, US). PROVINCE OF VALDIVIA: Valdivia, *Bridges* 612 (BM); Uferbüsch des Calle-calle, *Buchtien* s. n., Sept. 17, 1896 (E, GH, M, US); ad margines rivulorum, *Gay* 1019 (SGO); Isla del Ray, Carbonares, *Gunckel* 1097, 1149 (CSG); Valdivia, *Buchtien* s. n., 12.XI.1904 (LD); Valdivia, *Lechler* s. n. (M).

Coriaria ruscifolia L. subsp. *microphylla* (Poir.) L. Skog
stat. nov.

Coriaria microphylla Poir., Encyclopédie méthodique. Botanique 4: 87. 1804. Type: *J. Jussieu* s. n., P-JU.

Coriaria thymifolia Humb. & Bonpl. ex Willd., Species Plantarum, ed. 4. 4: 819. 1805. Type: *Humboldt & Bonpland* 3018, B, P.

Coriaria phyllicifolia Humb. & Bonpl. ex Willd., Species Plantarum, ed. 4. 4: 819. 1805, ex char.

Coriaria atropurpurea DC., Prodromus systematis naturalis regni vegetabilis 1: 740. 1824. Type: De Candolle, Calques des dessins de la flore du Mexique de Moçino et Sessé, t. 1167.

Heterocladus caracasanus Turcz., Bull. Soc. Imp. Naturalistes Moscou 20: 152. 1847. Type: *Galeotti* 293, LE.

Heterophyllea caracasana (Turcz.) Turcz., Bull. Soc. Imp. Naturalistes Moscou 21: 591.

Coriaria cuneifolia Sessé & Moc., Plantae Novae Hispaniae, ed. 1. 173. 1890, *ex char.*

Suffruticose herbs to large shrubs. Main axes to 4 m. long bearing numerous short lateral branches. Leaves opposite to approximate, 0.5 to 3.1 cm. long, 0.2 to 1.6 cm. wide. Racemes terminating the lateral branches, to 15 cm. long.

Vernacular names: COLOMBIA: rebentadera. ECUADOR: piñán, shansi, shanchi or zhanzhi, tinta. GUATEMALA: moco tinto, moco de chompipe. MEXICO: helecho de tierra, tlalocopetate, tlalocopatlatl. PERU: mio-mio, saca-saca, mio-venenosa, raqui-raqui. VENEZUELA: tisís, helecho de playa, helecho-uvite.

Distribution and habitat in the Western Hemisphere: Moist montane forest openings and hillsides in Mexico, Guatemala and Panama and on the western slopes of the Andes in Colombia, Venezuela, Ecuador and Peru.

The plants referred to this subspecies have long been named *C. thymifolia* Humb. & Bonpl. *ex Willd.* *Coriaria microphylla* Poir. predates *C. thymifolia* by almost two years, however, and should be used if this group is maintained as a separate species.

Representative specimens examined: COLOMBIA. ANTIOQUIA: La Sierra, 18 km. north of Medellín, 2000 m., Archer 1307 (BM, COL, US). BOGOTÁ: Holton 27, 808 (GH); Triana 5596 (BM, COL); Cordillera de Bogotá, 2650 m., Triana s. n. (BM, MEXU). BOYACA: Grubb, Curry & Fernández-P. 519 (COL, US). CALDAS: Killip & Hazen 8956 (GH, US); Laguneta, Salento, 2500 m., von Sneidern 3149 (COL, MO). CAUCA: Cordillera Central, vertiente occidental, 2470 m., Cuatrecasas 19369 (A, 2 sheets, F); Puracé, Fernández-P. 6218A (COL); entre Popayán y Puracé, 2500 m., Yepes Agredo 390 (COL, F, US). CUNDINAMARCA: Salto de Tequendama, 2100 m., Alston 7409 (BM); García-Barriga 130, 17488 (COL); al sur de Usme, entre La Regadera y El Hato, 3000-3100 m., Idrobo, Jaramillo, Mesa-Bernal & Smith 399 (COL, MO, US). HUILA: Cordillera oriental, east of Neiva, 1300-1800 m., Rusby & Pennell 1008 (GH, MO, US). MAGDALENA: Van der Hammen 1165 (COL). NARIÑO: Fernández-P., et al. 1083 (COL); Pasto, Cebadal, 2700-2800 m., Schultes & Villarreal 7939 (COL, F, US). NORTE DE SANTANDER: Cuatrecasas & García-Barriga 10064 (COL, US). PUTOMAYO: García-Barriga 7766 (COL, US); Valley of Sibundoy,

Sibundoy, 2225-2300 m., *Schultes & Villarreal* 7714 (COL, F). SANTANDER: *Killip & Smith* 16784, 19227 (A, GH, US). TOLIMA: *Cuatrecasas* 9361 (COL, US). VALLE: Cordillera Central, vertiente occidental, 2270-2320 m., *Cuatrecasas* 18140 (F). COSTA RICA. CARTAGO: Volcán Irazú: 10000-11300 ft., *Allen* 676 (F, MO); *Fournier* 1202 (CRU); Potrero Cerrado road, 6500 ft., *Lankester* s. n., 1925 (F, US); 2400 m., *Skog* 1339 (CONN); *Smith* 4761 (GH, US, 2 sheets); 1400 m., *Torres-R.* 288, s. n., 1924 (SU). ECUADOR. AZUAY: Río Tarqui, 8300 ft., *Camp E-3905* (F, GH, US). BOLIVAR: entre Guaranda y Vinchoa, 2800 m., *Acosta Solís* 5927 (F). CAÑAR: near the village of Marcos, *Camp E-2488* (MO). CHIMBORAZO: 2450 m., *Acosta Solís* 5534 (F); *Huigra, Rose & Rose* 22182 (BM, US). IMBABURA: Shanchipamba, 2750 m., *Acosta Solís* 14514 (F, 2 sheets). LOJA: 2200 m., *Dodson & Thein* 567 (MO); near Loja, between 2300-2700 m., *Skog* 1162, 1167, 1168, 1169, 1172, 1192 (CONN). PINCHINCHA: Cord. occ., los Alpes, 2800-3000 m., *Acosta Solís* 7079 (F); vicinity of Quito, 3000 m., *Asplund* 6157 (LD, US); above Quito, 10300 ft., *Balls* B5846 (BM, E, MO, US); Quito, *Couthouy* s. n., 1855 (GH); Quito, *Jameson* 206 (BM); Alrededores de Quito, 2850 m., *Paredes* 23 (Q). TUNGURAHUA: entre Leito y la Coma, Cord. oriental, 2700-3000 m., *Acosta Solís* 8977 (F); Volcano Tungurahua, 2200-2400 m., *Dodson & Thein* 1886 (MO); Rio Ambato Valley, W. of Ambato, *Fagerlind & Wiborn* 965 (LD). LOCALITY NOT DEFINITE: *Heinricks* 634 (M); interandine highland, 2000 m., *Rimbach* 97, (A, F). GUATEMALA. CHIMALTENANGO: Barranco de La Sierra, southeast of Patzúm, about 2100 m., *Standley* 61508 (A, F). EL PROGRESO: slopes adjacent to Finca Piamonte, 2500-3000 m., *Steyermark* 43711 (A, F). ESQUINTLA: Texcuaco, 150(?) m., *Morales* 1061 (F). GUATEMALA: near Finca La Aurora, 1500 m., *Aguilar* 248 (F); near Guatemala, *Kellerman* 5252 (MEXU, US); Pinula, 4200 ft., *J. Donnell Smith* 1928 (M). HUEHUETENANGO: San Juan Atitan, 8400 ft., *Skutch* 1166 (A, F). JALAPA: between Miramundo and summit of Montaña Miramundo 2000-2500 m., *Steyermark* 32753 (F). QUEZALTENANGO: Sunil, *Hartweg* 524 (BM, GH, LD); near Santa Maria de Jesus, 6400 ft., *Skutch* 901 (A, F, US). SACATEPEQUEZ: Near Antigua, 6000 ft., *Kellerman* 7510 (F, 2 sheets, US); near San Lucas, 2300 m., *Williams & Molina* 11833 (F, GH). SAN MARCOS: southwest of San Marcos, 8000 ft., *Morley* 725 (F, GH, US). SOLOLÁ: Volcán Atitlán, *Beaman* 4091 (GH); Volcán Santa Clara, 2100-3000 m., *Steyermark* 46991 (F). JUNCTION OF HUEHUETENANGO, TOTONICAPÁN AND QUEZALTENANGO: Sierra Madre mountains, 2400-2600 m., *Williams, Molina & Williams* 22608 (F). LOCALITY NOT DEFINITE: *Fosberg* 19055 (COL, US). MEXICO. CHIAPAS: Puerto Viento, Rayón, *Breedlove* 9003 (BM); Mt. Pasitar, near San Cristobal, *Matuda* 461 (F, MEXU, MO, US); Mt. Tacana, 1000-2000 m., *Matuda* 2417 (A, F, MEXU); near San Cristobal de las

Casas, above 7000 ft., *Pfeifer, Kremer & Abendroth* 2501 (CONN, 2 sheets); Rio Prospero, *Seler* 2269 (GH, US). GUERRERO: *Hinton* 14201, 15398 (GH, US); Distrito Mina, Petlacala, *Ynes Mexia* 8972 (F, GH, MO). JALISCO: Rich canyons, mountains near Lake Chapala, *Pringle* 2437 (BM, F, GH, M, MEXU, MO, US). MEXICO: ravines near Ozumba, 8000 ft., *Pringle* 9713 (CU, F, GH, MEXU, MO, US); *Pringle* 11971 (CU, F, GH, US); along brooks, Amecameca, *Purpus* 1768 (F, GH, MO, US); Ozumba, *Purpus* 3057 (BM, E, F, GH, MO, US). MICHOACAN: San Juan Viejo, *Beaman* 4393 (GH); near Paracutín, along road into Angahuan, 7500 ft., *Bratz* M-806 (MEXU); Tancitaro, Uruapan, *Hinton* 15448 (GH, US); 2 km. N. & NE. of Puentacillar, *Iltis, Koeppen & Iltis* 387 (BM); above Tancitaro, 7000 ft., *Leavenworth* 270 (F, GH, MO). MORELOS: Jojutla a de Juárez, D. de Juárez, Salazar s. n., August 8 1912 (MEXU, 2 sheets). SINALOA: Along Mex. #40, between Durango and Mazatlan, steep mountain sides, *Pfeifer & Skog* 3073 (CONN). PANAMA. Volcán de Chiriquí Potrero Muleto, Boquete district, 10400 ft., *Davidson* 1013 (A, F, US); between El Hato and Cerro Punta, Llanos, *Ebinger* 800 (MO); Petrero Muleto to summit de Chiriquí, *Woodson & Schery* 416 (GH, US). PERU. APURIMAC: Prov. Abancay, arriba Abancay, 3300-3500 m., *Ferreyra* 9801 (USM); Abancay, *Vargas* 1954 (CUZ); between Huancarama and Cochacaya, 3400 m., *West* 3761 (GH, MO). AYACUCHO: Aina, between Huanta and Río Apurimac, 750-1000 m., *Killip & Smith* 23119 (F, US). CUZCO: Machu-Picchu, 7600 ft., *Gourlay* 87 (E); Machu-Picchu, 2200 m., *Skog* 1144, 1146, 1147 (CONN); Machu-Picchu, 6000 ft., *Stafford* 1053 (BM, F); Urubamba, 2000 m., *Vargas* 1871 (CUZ, GH); Pillahuata, cerro de cusilluyoc, 3000-3300 m., *Pennell* 14131 (F, GH, US); Prov. Quispicanchis, Dist. Marcapata, 3000 m., *Vargas* 9701 (A, F, MO); Ollantaytambo, about 3000 m., *Cook & Gilbert* 607 (A, F, GH, US, 2 sheets). HUANCAVELICA: east of Surcumbamba, Prov. Tayacaja, 2500 m., *Stork & Horton* 10343 (A, F, MO). HUANUCO: Prov. Ambo, cerca a San Rafael, 2600 m., *Ferreyra* 1961 (USM, US); Pampayacu to Huanuco, *Kanehira* 230 (A, F); Chaglia, *Woytkowski* 5293 (F, MO). JUNIN: east of Huasahuasi, 2400-2500 m., *Hutchinson* 1115 (BH, F, GH, M, MO, US, USM). LA LIBERTAD: Prov. Otuzco, cerca a Usquil, 3000-3100 m., *Ferreyra* 7668 (US, USM). PUNO: Prov. Carabaya, Ollachea, 2700 m., *Vargas* 6918 (CUZ). LOCALITY NOT DEFINITE: *Jameson* 577 (E); "Perou," *J. Jussieu* s. n. (P-JU); *Ruiz & Pavon* s. n. (BM, MO). VENEZUELA. MÉRIDA: Mérida, *Alston* 6673 (BM, US); Plaza de Mucuqui, 2200 m., *Bernardi* 189 (MER, VEN); northeast of Mérida along road to Valencia, 1850 m., *Breteler* 3300 (CONN, IFLA, 3 sheets, US); San Rafael, 3185 m., *Gehriger* 9 (A, GH, MO, US); Distrito Campo Elías, San José de Acequias, 2400 m., *López-Palacios* 774 (CONN, MER); El Cucharito near Tabay Village, 1800 m., *Skog* 1247 (CONN); between Tabay and

Mérida, along Río Chama, 1820 m., Steyermark 55865 (F). TÁCHIRA: Distrito Uribante, San José, antes de la población de Pregonero, 1440 m., Marcano-Berti 1680 (CONN, MER). TRUJILLO: Jajó, Burkart 16686 (VEN).

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LITERATURE CITED

- BENTHAM, G. & J. D. HOOKER. 1862. *Genera Plantarum* 1: 429.
- CANDOLLE, A. P. DE. 1816. *Essae sur les propriétés medicales des plantes*, ed. 2. p. 350-351.
- CRONQUIST, A. 1968. The Evolution and Classification of Flowering Plants. 396 p.
- HALLIER, H. 1905. Provisional scheme of the natural (phylogenetic) system of Flowering Plants. *New Phytologist* 4: 151-162.
- HUTCHINSON, J. 1964. The Genera of Flowering Plants. 1: 172-173.
- LAWRENCE, G. H. M. 1951. *Taxonomy of Vascular Plants*. 823 p.
- MAXIMOWICZ, C. J. 1881. De *Coriaria*, *Ilice* et *Monochasmate*, hujusque generibus proxime affinibus *Bungea* et *Cymbaria*. *Mém. Acad. Imp. Sci. Saint Pétersbourg*, sér. 7. 29(3): 1-13.
- RUSROW, E. 1884. Über den anatomischen Bau der Laubsprosse der Coriarieen. *Sitzungsber. Naturf.-Ges. Univ. Dorpat* 6: 88.
- L. H. BAILEY HORTORIUM
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ITHACA, NEW YORK